

## Overview

*Malaysia is the second largest oil and natural gas producer in Southeast Asia, the second largest exporter of liquefied natural gas globally, and is strategically located amid important routes for seaborne energy trade.*

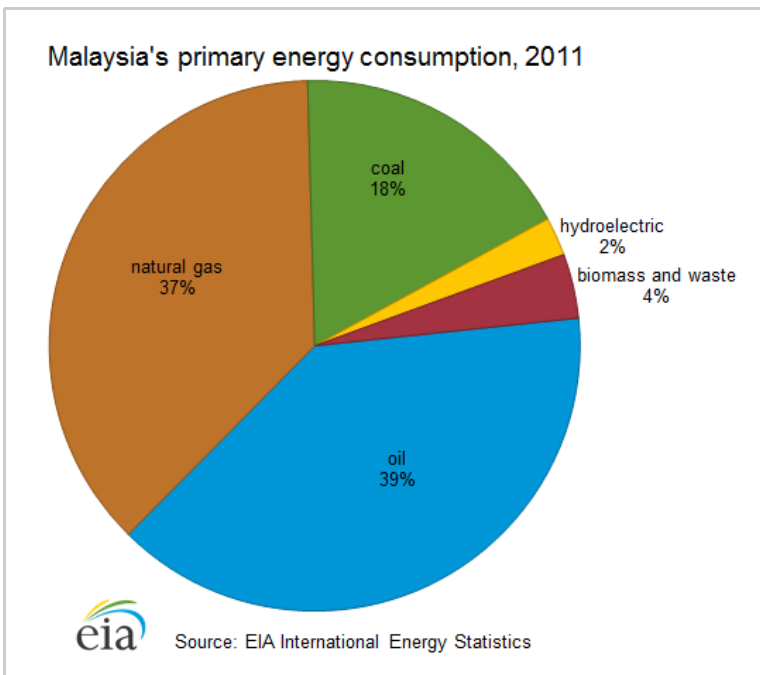
Malaysia's energy industry is a critical sector of growth for the entire economy and makes up about 20 percent of the total gross domestic product. New tax and investment incentives, starting in 2010, aim to promote oil and natural gas exploration and development. These incentives are part of the country's economic transformation program to leverage its resources and location to be one of Asia's top energy players by 2020. Another key pillar in Malaysia's energy strategy is to become a regional oil storage, trading, and development hub that will attract technical expertise and downstream services able to compete within Asia.

Malaysia, located within Southeast Asia, has two distinct parts, the western half that contains the Peninsular Malaysia and the eastern half that includes the states of Sarawak and Sabah, which share the island of Borneo with [Indonesia](#) and Brunei. The country's western coast runs alongside the [Strait of Malacca](#), an important route for the seaborne trade that links the Indian and Pacific Oceans. Malaysia's position in the South China Sea makes it a party to various disputes among neighboring countries over competing claims to the sea's resources. While it has bilaterally resolved competing claims with Vietnam, Brunei, and [Thailand](#), an area of the Celebes basin remains in dispute with Indonesia. Potential territorial disputes with [China](#), Vietnam, and the Philippines could emerge as exploration initiatives move into the deep water areas of the [South China Sea](#).

Malaysia is unveiling several major upstream and downstream oil and natural gas projects in the next few years, with some coming online in the next few months, as part of the country's strategy to enhance output from existing oil and natural gas fields and to advance exploration in deep water areas. The incumbent and long-ruling Barisan Nasional party (BNP) won the May 2013 election and will retain governing power. The BNP has a track record of promoting hydrocarbon investment and intends to continue boosting oil and natural gas production and developing energy infrastructure in the country.

Oil and natural gas are the main primary energy sources consumed in Malaysia, with shares of 39 percent and 37 percent, respectively in 2011. About 18 percent of the country's

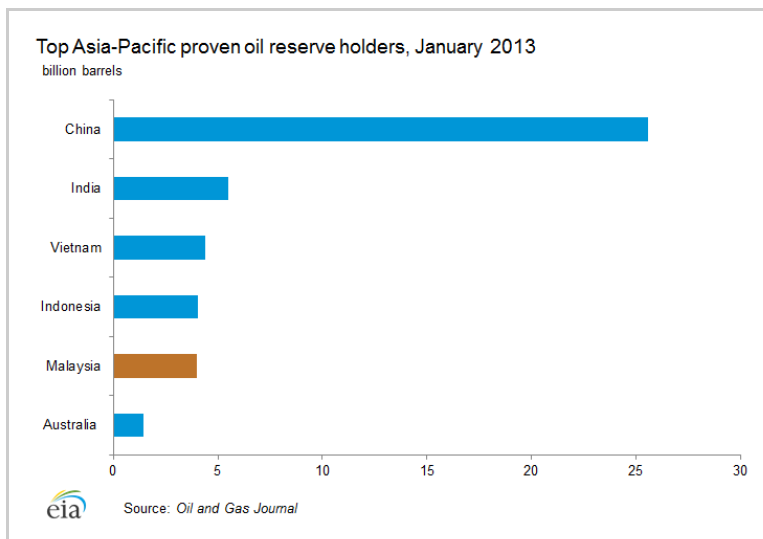
energy consumption is met by coal. Biomass and waste make up another 4 percent, and hydropower contributes 2 percent to total consumption. Malaysia's heavy reliance on oil and natural gas to sustain its economic growth is causing the government to emphasize fuel diversification through coal imports and to promote investments in renewable energy.



## Oil

*Malaysia's oil reserves are the fifth highest in Asia-Pacific and one of the top 30 highest reserves in the world.*

According to the *Oil & Gas Journal* (OGJ), Malaysia held proven oil reserves of 4 billion barrels as of January 2013, the fifth-highest reserves in Asia-Pacific after China, [India](#), Vietnam, and Indonesia. Nearly all of Malaysia's oil comes from offshore fields. The continental shelf is divided into three producing basins: the Malay basin offshore peninsular Malaysia in the west and the Sarawak and Sabah basins in the east. Most of the country's oil reserves are located in the Malay basin and tend to be light and sweet crude. Malaysia's benchmark crude oil, Tapis Blend, is a light and sweet crude oil, with an API gravity of 42.7° and a sulfur content of 0.04 percent by weight.



## Sector organization

Energy policy in Malaysia is set and overseen by the Economic Planning Unit (EPU) and the Implementation and Coordination Unit (ICU), which report directly to the Prime Minister. Malaysia's national oil and gas company, Petronas Nasional Berhad (Petronas), holds exclusive ownership rights to all oil and gas exploration and production projects in Malaysia, and is responsible for all licensing procedures. The company is directed by the Prime Minister, who also controls appointments to the company board. Petronas holds stakes in the majority of oil and gas blocks in Malaysia, and it is the single largest contributor to Malaysian government revenues, about 45 percent, by way of taxes and dividends. Since its incorporation in 1974, Petronas has grown to be a world-renowned integrated international oil and gas company with business interests in over 30 countries. Under legislation enacted in 1985, Petronas is required to hold a 15-percent-minimum equity in production sharing contracts (PSC) with all foreign and private companies. In 2012, Petronas signed 13 PSCs, a record-high number of agreements for any single year.

ExxonMobil, Shell, and Murphy Oil are the largest foreign oil companies by production volume, and Shell is the largest foreign investor in Malaysia's oil sector. New opportunities for investment in Malaysia's energy sector have attracted small and medium-sized oil independents such as Talisman Energy, Lundin Petroleum, Newfield Energy, Roc Oil, and Petrofac.

In 2010 Malaysia provided tax incentives for upstream investment in both enhanced oil recovery (EOR) and marginal field development projects. The income tax rate for marginal fields dropped from 38 percent to 25 percent, and the government waived export duties on total oil production from these smaller fields. Malaysia also provided income tax allowances of up to 100 percent of capital expenditure for EOR projects. Additionally, the government announced more tax incentives for oil and gas trading companies in late 2012.

Malaysia's oil and gas policy historically has focused on maintaining the reserve base to ensure long-term supply security while providing affordable fuel to its population. In July 2010, the government introduced subsidy reductions for gasoline, diesel, and liquefied petroleum gas (LPG) with the aim of gradually decreasing fuel subsidies to reduce government expenditures. Further cuts in fuel subsidies are planned, but public sensitivities

over these cuts have stalled further subsidy reform.

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## Exploration and production

*Declines in production at Malaysia's major producing oil fields in the past decade have led government efforts to encourage investment in enhanced oil recovery and development of smaller, marginal, and deep water fields.*

Malaysia is Southeast Asia's second largest oil producer behind Indonesia. Total oil production in 2012 was an estimated 643,000 barrels per day (bbl/d), slightly higher than 626,000 bbl/d in 2011. Nearly 80 percent of total liquids are crude oil, and the remainder consists of condensates, natural gas liquids, gas-to-liquids (GTL) fuel, biodiesel, and refinery processing gain. More than half of Malaysian oil production currently comes from the Tapis field in the offshore Malay basin. The country's oil production has experienced overall decline since peaking at 862,000 bbl/d in 2004 as a result of maturing fields, particularly larger fields in the shallow waters offshore Peninsular Malaysia. Some recent drilling efforts in the area such as Lundin Petroleum's Bertam oilfield in the Penyu Basin are expected to add incremental will help offset production declines from mature fields. Lundin anticipates the Bertam field will yield 20,000 bbl/d by the second half of 2014.

Malaysia's domestic oil consumption has risen while production has been falling over the past decade, leaving smaller volumes of oil available for exports. The government's goal is to bring oil production back to prior levels of 800,000 bbl/d by 2015. Malaysia is working to attract new investment opportunities and reverse production declines by enhancing output from existing fields, developing small, marginal fields through risk service contracts (RSCs) that share the risk where Petronas is the project owner and investors are the service providers receiving revenues for oil produced, and tapping into new oil and natural gas discoveries in deep water offshore areas of Sarawak and Sabah basins. These deep water offshore fields pose more technical challenges, spurring greater cooperation with and incentives for foreign energy firms. Petronas plans to spend \$90 billion by 2016 to boost oil and natural gas production.

### Enhanced oil recovery (EOR) projects

ExxonMobil's Tapis EOR project, which lies 118 miles off Terengganu, is expected to begin at the end of 2013. Tapis is one of seven mature fields offshore Peninsular Malaysia that ExxonMobil and Petronas have agreed to develop as part of a 25-year production-sharing contract that was finalized in June 2010. Under the agreement, which includes provisions for the deployment of EOR, work is being carried out on seven fields that are part of the Tapis crude oil blend - Seligi, Guntong, Tapis, Semangkok, Irong Barat, Tebu, and Palas.

In 2011, Shell and Petronas agreed to invest \$12 billion over 30 years in two EOR projects offshore Sarawak and Sabah (Baram Delta and North Sabah) covering nine fields. The projects are expected to boost reserves by 750 million barrels and use the world's first offshore, chemical injection process for resource recovery.

### Risk service contracts (RSC) projects

In addition to EOR projects, Malaysia is also maximizing its production potential by issuing RSCs beginning in 2011. These contracts involve risks shared between Petronas, the

project owner, and the contractors (foreign and domestic companies), which act as service providers. These companies receive compensation for cost and a return on investment.

As part of its RSC licensing rounds, Petronas awarded Malaysia's first RSC, the Berantai gas field, to Petrofac and domestic companies Kencana petroleum and SapuraCrest in 2011. The field began production in 2012 with 50 million cubic feet per day (MMcf/d) of natural gas. The second RSC, the Balai Cluster offshore Sarawak, was awarded in August 2011 to Australia's Roc Oil Company, Malaysia's Dialogue, and Petronas. Recent exploration activity in Cendor, a marginal field located off the Malay Basin, suggests production could be 30,000 bbl/d of oil by 2014 and could provide upside production potential for small, underexplored fields.

### **Deep water projects - Sarawak and Sabah**

Several major projects are under development in the deep water area offshore the Sabah state, which could bolster Malaysia's oil production over the next decade. The Kikeh oil field, operated by Murphy Oil in partnership with Petronas, is currently Malaysia's only producing deepwater oil field. The Kikeh field came on stream in 2007 at an initial rate of 20,000 bbl/d, and estimated production in 2010 was 115,000 bbl/d of oil. However, in 2011, output dropped to an estimated 63,000 bbl/d as a result of production issues and a well leak. Murphy Oil has been working to restore production, which is expected to peak at 120,000 bbl/d.

Also, in offshore Sabah, the Gumusut/Kakap project is under development and will include the region's first deep water floating production system from 19 subsea wells.

Gumusut/Kakap came on stream at the end of 2011 with production of 25,000 bbl/d. Its production is expected to ramp up to 120,000 bbl/d by the end of 2013 once the new floating production system is commissioned. Shareholders are operator Shell with 33 percent; ConocoPhillips with 33 percent; Petronas with 20 percent; and Murphy Oil with 14 percent. The system will be connected via pipelines to the new Sabah Oil and Gas Terminal being built in Kimanis in the Northeast Sabah state.

The Malikai oil and gas field, first discovered in 2004, is located offshore Sabah and holds a production capacity of 60,000 bbl/d. Malikai will be tied into the Keabangan Northern Hub development project (KBB) via a liquids and dry gas pipeline shortly after first gas comes from KBB. Shell, the operator and a 35-percent stakeholder, expects to bring Malikai online in mid-2015. Other project partners include ConocoPhillips (35 percent) and Petronas (30 percent).

Development is also underway at the KBB, which will tie together the Gumusut/Kakap, Malikai, and Kikeh oil fields. KBB will be a hub for the development of deep water oil and gas assets offshore Sabah. The KBB platform has a design capacity of 825 MMcf/d of natural gas and 25,000 bbl/d of condensate.

Petronas recently announced that it discovered the country's first onshore oil and gas field in over two decades in Sarawak. The field's current initial flows are 440 bbl/d of crude oil and 11.5 MMcf/d of natural gas, which may help boost hydrocarbon production.

### **Boundary disputes**

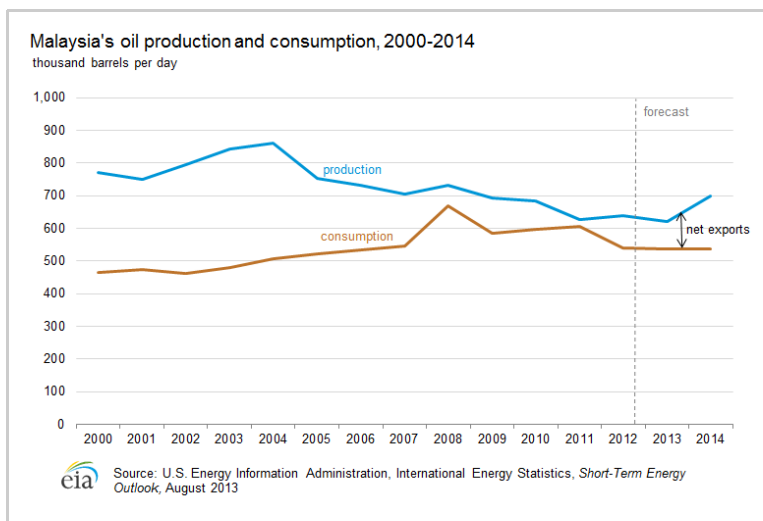
Malaysia began cooperating with neighboring countries bordering the South China Sea to

exploit the area's significant hydrocarbon potential. The Commercial Arrangement Area (CAA) in the Malay Basin, which Malaysia shares with Vietnam, also contributes to the country's oil production. Talisman Energy (Canada) holds operating interests in the Northern and Southern oil fields in the CAA. While the Southern Fields are still under exploration, the Northern Fields development began producing 25,000 bbl/d in 2009, reportedly rising to 50,000 bbl/d in 2010. The shared area also produces about 250 MMcf/d of natural gas. Talisman holds a 41 percent interest, Petronas holds a 46-percent interest, and PetroVietnam has a 13-percent interest.

The 20-year dispute between Malaysia and Brunei over land and sea boundaries was resolved when the two countries signed a boundary agreement in April 2009. Blocks L and M were ceded to Brunei, while Limbang, on the Sarawak-Brunei border, was ceded to Malaysia. In 2010, Petronas and the Brunei government agreed to jointly develop the two blocks offshore Borneo Island, and they signed a 40-year PSA for newly named Blocks CA1 and CA2. Drilling commenced in 2011, along with further investment plans.

As discussed in further detail below in the natural gas section, Thailand and Malaysia signed an agreement in 1979 to jointly develop oil and natural gas reserves from the Malaysia-Thailand Joint Development Area (MTJDA), which overlaps the maritime borders of both countries.

Other areas in the South China Sea such as the Celebes Basin that borders Indonesia and Malaysia have remained underexplored because there are competing territorial claims between the two countries. Shell holds an exploration contract with Petronas for two deep water blocks off the east coast of Sabah; however, Indonesia also awarded separate PSCs for the blocks and claims them. It is likely these PSCs will be dormant as long as territorial maritime disputes remain unresolved.



## Oil pipelines

Malaysia has a relatively limited oil pipeline network and relies on tankers and trucks to distribute products onshore. Malaysia's main oil pipelines connect oil fields offshore Peninsular Malaysia to onshore storage and terminal facilities. The 124-mile Tapis pipeline runs from the Tapis oil field and terminates at the Kerteh plant in Terengganu, as does the 145-mile Jerneh condensate pipeline. The oil pipeline network for Sabah connects offshore

oil fields with the onshore Labuan oil terminal. This network is currently expanding following the launch of development projects including the Kebabangan cluster, the Malikai, Gumusut/Kakap, and Kikeh oil fields. For Sarawak, there are a few other oil pipelines connecting offshore fields with the onshore Bintulu oil terminal. The majority of pipelines are operated by Petronas, although ExxonMobil also operates a number of pipelines connected with its significant upstream holdings located offshore Peninsular Malaysia.

An international oil products pipeline runs from the Dumai oil refinery in Indonesia to the Melaka oil refinery in Melaka City, Malaysia. An interconnecting oil products pipeline runs from the Melaka refinery via Shell's Port Dickenson refinery to the Klang Valley airport and to the Klang oil distribution center.

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## Exports and imports

Malaysia remains a total net oil exporter despite the narrowing gap between total exports and total imports. Malaysia exports about half of its crude oil production because the crude quality (light and sweet) is attractive to the Asian markets and fetches a higher premium compared to other crude blends. In return, Malaysia imports lower-cost heavy sour crude oil for its refineries. Malaysia exported 245,000 bbl/d of crude oil in 2010, significantly lower than the 400,000 bbl/d export volume in 2000. All of Malaysia's crude oil is exported within Asia Pacific, the bulk of which is sent to Australia, India, Thailand, and Japan. Japan began buying more crude oil for direct burn in 2011 after it lost nuclear electric generation following the Fukushima accident. In 2010, Malaysia imported 160,000 bbl/d of lower-cost crude oil for processing at its oil refineries. More than half of Malaysia's crude oil imports are from the Middle East, primarily Saudi Arabia, United Arab Emirates, and Qatar.

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## Refining, storage, and transit terminals

*As a result of rising regional and domestic demand for crude oil and oil products, Malaysia plans to become a regional oil trading and storage hub by increasing the country's refining and storage capacity.*

According to OGJ, Malaysia has nearly 539,000 barrels per day (bbl/d) of refining capacity at seven facilities. Malaysia invested heavily in refining activities during the last two decades and is now able to meet most of its demand for petroleum products domestically, after relying on refineries in Singapore for many years.

As part of Malaysia's goal to compete with the oil refining and storage hub in Singapore, Petronas plans to build a \$20 billion refining and petrochemicals integrated development project (RAPID) in Johor state at the southern tip of Peninsular Malaysia by the end of 2017. This project includes a 300,000 bbl/d refinery, which industry expects will turn Malaysia from a net oil product importer to a net oil product exporter once it is operational. The project, which was sanctioned in 2011, has incurred some delays, prompting Petronas to push off a final investment decision on the project to early 2014.

## Malaysia's existing and planned refineries

Refinery	Operator	Capacity (bbl/d)	Status
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Melaka 1 (PSR-1)	Petronas	93,000	Existing  Distills sweet crude oil and condensate
Melaka 2 (PSR-2)	JV of Petronas and ConocoPhillips	126,000	Existing  Processes sour crude oil grades
Port Dickson	Shell	125,000	Existing  Supplies solely domestic market; can accept heavier crude oil grades
Port Dickson	San Miguel/Petron (Philippines)	86,000	Existing
Kertih	Petronas	40,000 crude distillation	Existing  Processes naphtha condensates through a splitter
Lutong	Shell	45,000	Existing  Only refinery located outside of Peninsular Malaysia
Kemaman	Kemaman Bitumen Company	24,000	Existing  Converts heavy crude oils to bitumen
RAPID	Petronas	300,000	Planned; 2017

*Sources: FACTS Global Energy, IHS Global Insight, OGJ, IEA, Petronas, Shell*

Malaysia is expanding its oil terminal and storage capacity as the need for more oil storage and trading grows within Asia. Most of the country's oil product and crude oil terminals are located along the eastern coast of Peninsular Malaysia and offshore as floating storage and production facilities. Malaysia's shipping company, MISC, and global oil trader, Vitol Group, reported they plan to double the storage capacity at the Johor Terminal by mid-2014, which began operations in 2012 and is Malaysia's largest oil terminal.

The Pengerang oil storage terminal in Johor is under development by a joint venture including Vopak (Dutch) and Dialogue (Malaysia) and is expected online by 2014.

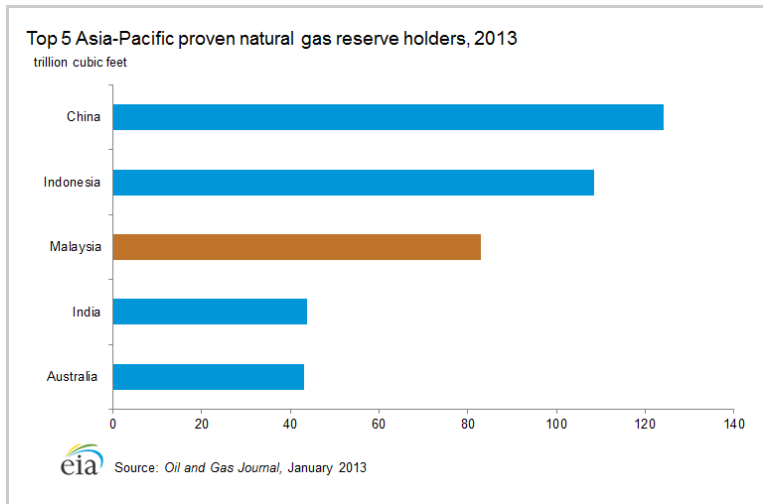
As part of Petronas' plan to invest \$14 billion in upstream and downstream activities in the Sabah state, the national oil company (NOC) is constructing the Sabah Oil and Gas Terminal (SOGT) in Kimanis, Sabah. The terminal is scheduled to receive oil and gas by the beginning of 2014. SOGT will become a central hub for much of the hydrocarbon development in offshore Sabah from new fields coming online recently — Gumusut/Kakap, Kikeh, and Malikai. The terminal has a design capacity to process 260,000 bbl/d of crude oil, 77,000 bbl/d of condensates, and 1.3 billion cubic feet per day (Bcf/d) of natural gas.

## Natural gas

*Malaysia was the world's second largest exporter of liquefied natural gas after Qatar in 2012.*



According to the OGI, Malaysia had 83 trillion cubic feet (Tcf) of proven natural gas reserves as of January 2013, and it was the third largest natural gas reserves holder in the Asia-Pacific region. Over half of the country's natural gas reserves are in its eastern areas, predominantly offshore Sarawak. Most of Malaysia's gas reserves are associated with oil basins, although Sarawak and Sabah have an increasing amount of non-associated gas reserves that offset some of the declines from mature oil and gas basins offshore Peninsular Malaysia.



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## Sector organization

As in the oil sector, Malaysia's state-owned Petronas dominates the natural gas sector. The company has a monopoly on all upstream natural gas developments, and it also plays a leading role in downstream activities and the LNG trade. Most natural gas production comes from PSAs operated by foreign companies in conjunction with Petronas. Shell remains the largest gas producer in Malaysia.

The Malaysia International Shipping Corporation (MISC), which is 63-percent owned by Petronas, owns and operates ships for transporting hydrocarbons and chemicals around the world. The company has 27 LNG tankers and is the second-largest LNG fleet operator in the world by fleet size. The company also owns and charters 80 petroleum tankers and 28 ships for chemical transport.

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## Exploration and production

*Malaysia's natural gas production has risen over the past two decades to serve the growing domestic demand and export contracts. Recent foreign investment in deep water and technically challenging fields primarily in the Sarawak and Sabah states provides impetus to maintain natural gas production levels over the next few years.*

Although Malaysia's dry natural gas production has risen steadily over the past two decades, reaching 2.2 Tcf in 2011, growth slowed since 2007. Meanwhile domestic natural gas consumption has increased, reaching 1.1 Tcf in 2011, and accounted for about 50 percent of production. The power sector consumes about 74 percent of the Malaysia's natural gas market sales, and demand for power especially in Peninsular Malaysia is

expected to increase. Rising domestic demand and LNG export contracts place pressure on the gas supply, and Malaysia is actively investing in reservoir development to meet these needs. There are several ongoing projects that will expand natural gas production in Malaysia over the near term. Exploration and development activities in Malaysia continue to focus on offshore Sarawak and Sabah.

### **Malaysia-Thailand Joint Development Area**

One of the most active areas for natural gas exploration and production is the Malaysia-Thailand Joint Development Area (MTJDA), located in the lower part of the Gulf of Thailand and northern part of the Malay Basin. MTJDA reportedly holds 9.5 Tcf of proven plus probable natural gas reserves. The area is divided into three blocks, A-18, B-17, and C-19, and is administered by the Malaysia-Thailand Joint Authority (MTJA), with each country owning 50 percent of the MTJDA's hydrocarbon resources. Production at Block A-18 started in 2005 at the Cakerwala field, and the project's second phase brought on the Bumi, Suriya, and Bulan fields in 2008. Total gas production from Block A-18 is estimated to be 390 MMcf/d. Block B-17 came online in 2009 and produced 335 MMcf/d in 2010. Total production from the joint area was over 700 MMcf/d in 2011. The countries signed another agreement for production from the Bumi Bumi field, where 60 percent of the production will be designated for the MTJDA. MTJA continues to explore the area for more hydrocarbon discoveries.

### **Projects in Sarawak and Sabah**

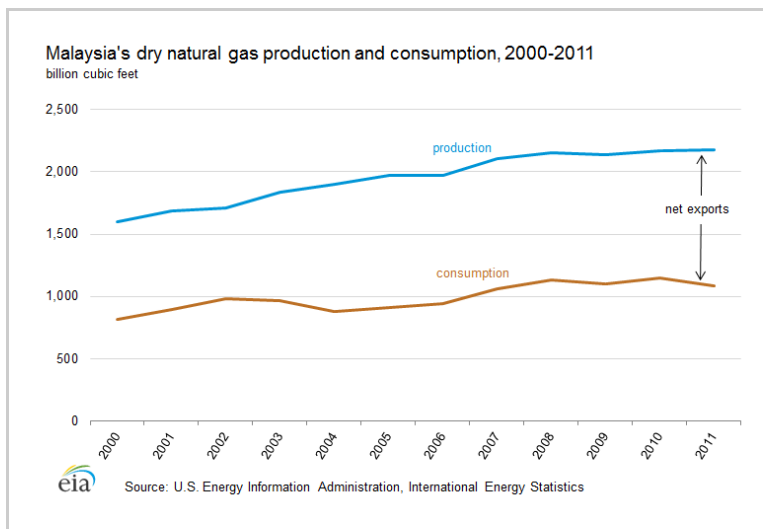
Most of Malaysia's natural gas production is offshore Sarawak and supports LNG exports from Bintulu. Shell has signed three oil and gas PSCs with Petronas in 2012 and stepped up drilling efforts in 2011 to continue developing gas and condensate production offshore Sarawak. The PSCs cover blocks SK319, SK318, and 2B in the Central Luconia Basin.

In 2009 Murphy Oil announced the startup of several smaller new gas fields located in Blocks SK309 and SK311. The Sarawak Gas Project, located 137 miles offshore Sarawak, contains a cluster of fields that are being developed as part of a multi-phase project to supply gas to the Bintulu LNG Terminal. Gas sales from the fields are currently 250 MMcf/d. Murphy Oil holds an 85-percent interest in the project, and Petronas holds a 15-percent interest.

Newfield Exploration made a significant gas discovery in its SK-310 PSC offshore Sarawak in 2013. The company claims the find could boost gas resources by 1.5 to 3 Tcf. Newfield holds 30 percent, while Petronas and Mitsubishi have stakes of 40 percent and 30 percent, respectively.

The Keabangan Petroleum Operating Company (KPOC), a consortium consisting of Petronas (40 percent), ConocoPhillips (30 percent), and Shell, the operator, (30 percent), are developing three contiguous gas and condensate fields including Keabangan, Kamunsu East, and Kamunsu East Upthrown Canyon (KBB Cluster) in the northwest Sabah state. The Keabangan field is estimated to hold 2 Tcf of gas. Production for KBB is expected to begin in 2014.

As part of the Sabah-Sarawak Integrated Oil and Gas Project, Petronas is commissioning the Kinabalu Non-Associated Gas development. Kinabalu is expected to have a production capacity of 300 MMcf/d and be available by the end of 2013.



## Pipelines

*Malaysia has an extensive gas pipeline network running through Peninsular Malaysia and pipelines that connect offshore fields in all three states to key infrastructure onshore.*

Malaysia has one of the most extensive natural gas pipeline networks in Asia, totaling about 1,530 miles. The Peninsular Gas Utilization (PGU) project, completed in 1998, expanded the natural gas transmission infrastructure on Peninsular Malaysia. The PGU system spans more than 880 miles and has the capacity to transport 2 billion cubic feet per day (Bcf/d) of natural gas. Other gas pipelines run from offshore gas fields to gas processing facilities at Kertih. Also, a number of pipelines link Sarawak's offshore gas fields to the Bintulu LNG facility.

The Sabah-Sarawak Integrated Oil and Gas Project, slated to be installed by 2014, includes the 310-mile Sabah-Sarawak Gas Pipeline (SSGP) that will transport 0.8 MMcf/d of gas from Sabah's offshore fields to Bintulu LNG for liquefaction and export. Some natural gas from the terminal is also reserved for fueling downstream industrial projects and power generation in Sabah. The SSGP is expected to be ready for operations in conjunction with the SOGT by 2014. Other pipelines link natural gas fields located in offshore Sabah to the Labuan Gas Terminal.

The Association of South East Asian Nations (ASEAN) is promoting the development of a trans-ASEAN gas pipeline system (TACP) aimed at linking ASEAN's major gas production and consumption centers by 2020. Because of Malaysia's extensive natural gas infrastructure and its location, the country is a natural candidate to serve as a hub in the ongoing TACP project. The first pipeline connected Malaysia with Singapore and was commissioned in 1991. Singapore currently has two contracts to import 84 Bcf/y of gas from Malaysia. Gas pipelines between West Natuna, Indonesia and Duyong, Malaysia, were installed in 2002, and Malaysia imported over 80 Bcf of gas from Indonesia in 2012. The Trans-Thailand-Malaysia Gas Pipeline, was commissioned in 2005, which allows Malaysia to transport natural gas from the Malaysia-Thailand JDA to its domestic pipeline system.

## LNG trade

*Malaysia remains a key exporter of LNG, second largest in the world after Qatar in 2012; however, the limited natural gas supplies and rising demand in the western part of the country triggered investment in regasification terminals, the first which commenced in 2013.*

## **LNG exports**

Malaysia was the second largest global LNG exporter after Qatar in 2012. The country shipped over 1.1 Tcf/y of LNG and contributed 10 percent of LNG exports worldwide according to FACTS Global Energy. The LNG consumers are Japan (63 percent), South Korea (17 percent), Taiwan (12 percent), and China (8 percent), all holding medium- or long-term supply contracts with Malaysia. Malaysia also has sold LNG cargoes to Petronas LNG Limited, a trading company, which ships spot LNG cargoes to many locations around the world. Despite growing demand for natural gas at home, Petronas is keen to maintain its long-term export contracts as they currently capture a higher price than gas sold domestically where the gas prices are regulated and subsidized.

The Bintulu LNG complex on Sarawak is the main hub for Malaysia's natural gas industry. Petronas owns majority interests in Bintulu's three LNG processing plants (Dua, Tiga, and Satu), which are supplied by the country's offshore natural gas fields. The Bintulu facility is one of the largest LNG complexes in the world, with eight production trains and a total liquefaction capacity of 1.2 Tcf/y following the debottlenecking completed at the end of 2010 at the Dua plant. Japanese financing has been critical to the development of Malaysia's LNG facilities. The Bintulu complex also hosts Shell's GTL project, which converts natural gas into nearly 15,000 bbl/d of liquids. Petronas is currently developing a ninth train at Bintulu LNG that will have bi-directional capabilities for both liquefaction and regasification processing. The NOC anticipates the additional 175 Bcf/y capacity will be online by 2016. The NOC also plans a mini-expansion of Bintulu LNG, providing an extra 32 Bcf/y of natural gas in 2014.

Petronas proposed two floating liquefaction terminals offshore Sarawak and Sabah to capture greater economic value from the country's smaller, more remote gas fields. These plants would have flexibility to serve the export or domestic markets. The Petronas FLNG project, located off Sarawak near the Bintulu LNG complex, will have a capacity of 58 Bcf/y. The final investment decision (FID) was made in 2012, and the project is scheduled to commence by the end of 2015. Rotan FLNG, the second proposed offshore LNG terminal, will monetize gas production from the Rotan field northeast of Sabah in the South China Sea. The terminal has a design capacity of 72 Bcf/y and could serve some domestic demand in Sabah by re-processing at the proposed Lahad Datu regasification plant. The project partners, Petronas (50 percent), MISC (25 percent), and Murphy Oil (25 percent), target a final investment decision for 2014 and commissioning by 2017. Altogether, proposed liquefaction projects and expansions are likely to add about 337 Bcf/y to Malaysia's export capacity in the next few years.

## **LNG imports**

Although Malaysia is one of the world's largest LNG exporters, the country currently experiences a geographic disparity of natural gas supply and demand among its regions. Natural gas demand is primarily from the power and industrial sectors in Peninsular Malaysia, while gas supply is in the eastern states of Sarawak and Sabah on Borneo Island. In order to meet the gas needs in Peninsular Malaysia, Petronas is developing

various regasification terminals to secure supply from the global gas market.

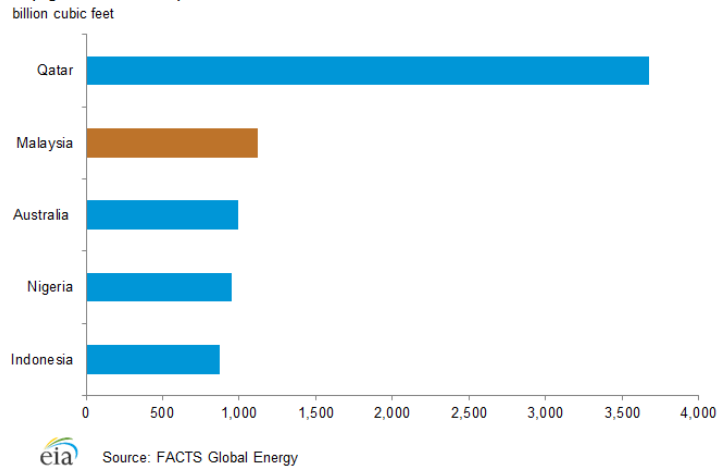
Petronas is the leading developer of several regasification projects slated to start operations by 2017. Malaysia's first regasification terminal, located near Malacca with a capacity of 182 Bcf/y, began operating in August 2013. In addition, Petronas Gas is set to invest \$2.6 billion over the next five years for the construction of two regasification terminals in Lahad Datu in Sabah and one of the terminals in Johor in Peninsular Malaysia. Lahad Datu is the only project located in the eastern region of Sabah. It is a smaller terminal designed to serve primarily the proposed 300 MW power generator at Lahad Datu. Petronas' terminal in Johor is part of the NOC's RAPID project that will include regasification and LNG storage and serve as a strategic oil and gas trading hub for the Asian region. A second terminal in Johor is proposed by a consortium (Royal Vopak, Dialogue Group, and the State Government of Johor) with a similar concept to be the first independent LNG trading facility in Asia, allowing users to store and trade gas. Petronas signed several agreements to supply its planned regasification capacity for the next decade. The NOC has long-term agreements with Qatargas and Gladstone LNG (Australia) and medium-term agreements with Pluto LNG (Australia), Snohvit LNG (Norway), and GDF Suez (global).

### Malaysia's existing and planned regasification terminals

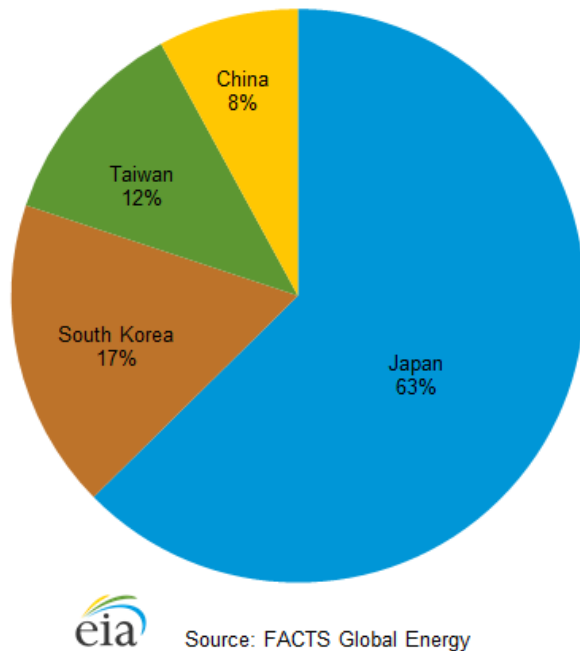
Regasification projects	Owners	Capacity (Bcf/y)	Status
Lekas LNG/Malacca	Petronas	184	Commenced operations May 2013
Johor LNG	Petronas	184	2017
Pengerang LNG	Dialogue Group (Malaysia) 46%, Royal Vopak (Netherlands) 44%, Johor state government 10%	Not available	Final Investment Decision anticipated 2013 Phase 1 - 2016 Phase 2 - 2018
Lumut	Petronas	Not available	Not available
Lahad Datu LNG	Petronas	37	2015
Pahang LNG	Pemandu of Malaysia	Not available	Not available

Source: FACTS Global Energy, PFC Energy, Petronas, Reuters

Top global LNG exporters, 2012



Malaysia's LNG exports by destination, 2012



## Electricity

*Malaysia's electricity demand, mostly met by natural gas and to a lesser extent coal, continues to expand rapidly; therefore, the country is seeking to add capacity to avoid future power shortages.*

Malaysia's economic and population growth has resulted in substantially higher electricity generation and consumptions over the past decade. Total generation jumped about 72 percent in the last 11 years, from 66 Terawatt-hours (TWh) in 2000 to an estimated 113 TWh in 2011. The Malaysian government anticipates that electricity demand will grow at an average rate of 3.1 percent per year through 2020.

According to the government, the industrial sector is the primary source of power demand and accounted for about 44 of the total in 2011. Commercial and residential demand stood at 34 percent and 21 percent, respectively. Transportation and agriculture made up less than 1 percent.

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## Sector organization

Each of Malaysia's three states has a key state utility that holds a monopoly in the transmission and distribution sectors. These companies are the largest stakeholders in power generation, although there is a sizeable private ownership through independent power producers (IPPs) that generate about half of the country's electricity. Tenaga Nasional Berhad (TNB) located in Peninsular Malaysia, held a 42-percent market share of electric generation in the state in 2011, while Petronas Gas and IPPs held the remaining shares. Sarawak Electricity Supply Berhad (SESCO) is fully owned by the Sarawak state government and controls all of Sarawak's power generation through a government joint venture. Sabah Electricity Sdn Berhad (SESB) is 80 percent owned by TNB and 20 percent by the Sabah government. IPPs generate over 50 percent of the electricity in Sabah.

The country has three electric transmission grids located in Peninsular Malaysia, Sarawak, and Sabah. The grid in Peninsular Malaysia, the largest of the three, connects with electricity systems in Thailand and Singapore. TNB plans to reduce transmission losses and increase electric supply reliability in Peninsular Malaysia over the next two decades.

One of Malaysia's energy policies is to reduce government subsidies by raising overall electricity and natural gas tariffs and pass through fuel costs to electricity end-users. Malaysia raised electricity tariffs for larger end-use consumers by 8.3 percent in June 2011 to help reduce the subsidy the government provides on behalf of electricity companies. The country's domestic natural gas prices are also fixed by the government at prices much lower than those of imported natural gas. The government raised the price of natural gas to power consumers by 28 percent in June 2011. The government also planned to pass through fluctuations in fuel prices and raise natural gas prices paid by electric power generators every six months starting in late 2011. However, natural gas prices have remained the same since 2011.

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## Electricity generation and capacity

*A majority of Malaysia's electricity generation capacity is natural gas-fired, although gas shortages in Peninsular Malaysia and growing electricity demand in recent years have spurred the use of other fuels such as coal, diesel, and hydroelectricity.*

Total installed generation capacity in 2012 was about 26.4 gigawatts (GW), mostly located in Peninsular Malaysia. In order to meet the country's growing demand, the government anticipates an additional 10.8 GW of new generation will come online by 2020 as 7.7 GW of existing capacity is retired. The government's efforts are centered on meeting increasing electricity demand through a more balanced portfolio of electric generation using coal, renewable sources, and to a lesser extent natural gas, in the next decade. Malaysia's policy to reduce power consumption also entails reforming electricity prices to be more reflective of market values and promoting demand-side conservation measures.

Fossil fuels, primarily coal and natural gas, make up nearly 90 percent of Malaysia's electric generation capacity. Natural gas accounted for about 51 percent of the country's total installed capacity in 2012, according to PFC Energy and about 43 percent of the electricity generation in 2011, according to TNB. Many of these gas plants are located in Peninsular Malaysia, and some have dual-fuel capabilities allowing for greater flexibility in fuel type. Natural gas shortages in Peninsular Malaysia in recent years caused by production declines in the state resulted in power outages and greater use of more expensive diesel-fired and coal-fired generation. Peninsular Malaysia intends to import LNG as well as diversify its power share with other fuels such as coal and hydroelectricity to alleviate gas and power shortages.

TNB is constructing a 1,071-MW combined-cycle gas turbine plant in Penang, Peninsular Malaysia to be completed in 2015. Also, Sabah is building two 300-MW gas-fired plants including the Kimanis Power Plant, which will purchase gas from the Sabah oil and gas terminal by 2014. The Lahad Datu power plant is being developed to use gas from the adjacent regasification terminal project. Although diesel accounts for a very small portion of the capacity and generation, it has played a critical role as an alternative fuel to alleviate some power shortages when other fuels are in short supply. Diesel accounted for 6 percent of the electricity generation in 2011.

Coal, which accounted for 35 percent of total installed capacity in 2012 and 45 percent of electricity generation in 2011, has become more competitive with gas in terms of price and has gained share in power generation in Peninsula Malaysia in the past few years. There are plans to increase coal-fired capacity in Peninsular Malaysia and Sarawak by 2020. Malaysia signed construction contracts for the country's first use of supercritical coal technology for two power plants located at Manjung and Tanjung Bin on Peninsular Malaysia. The plants are scheduled to add 2 GW of coal-fired capacity by 2016. Also, Malaysia issued bids for companies to build another 3 GW of coal-fired capacity in two projects on Peninsular Malaysia by 2019. Sarawak intends to use the country's limited coal production, located on Borneo Island, and coal imports, for five new coal plants with a total capacity of 2.4 GW. The first plant is scheduled to commence operations in 2016. These plants are designed to fill some of the state's power supply gaps as Sarawak expands the presence of heavy, energy-intensive industries.

Malaysia produced only 3 million short tons of coal in 2011, about 12 percent of its coal needs, and is limited in domestic coal reserves. Malaysia's coal imports, mainly from Indonesia, have doubled in the last five years to about 24 million short tons to fuel greater coal-fired generation.

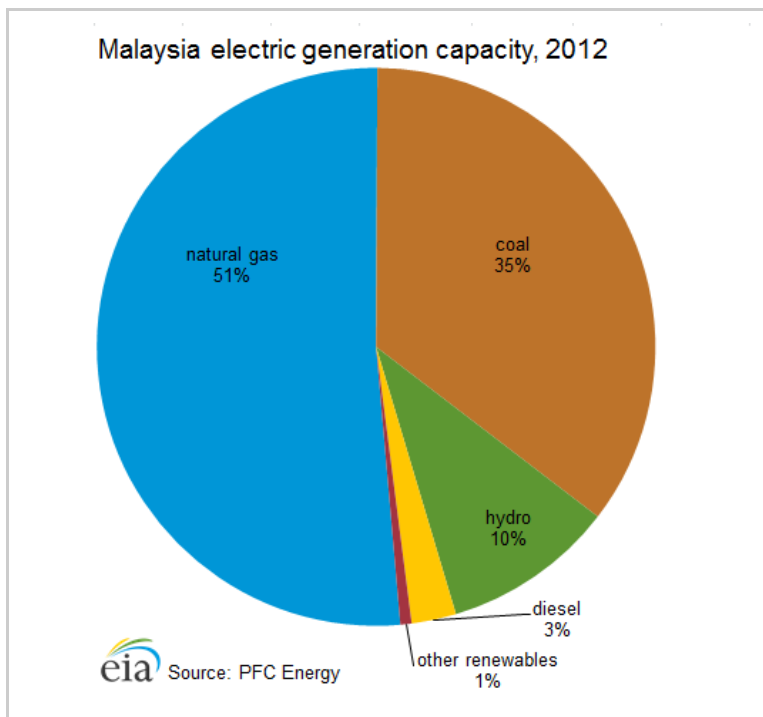
Hydroelectric capacity, which currently makes up about 10 percent of total electric capacity and 6 percent of electricity generation in 2011 in Malaysia, is undergoing significant expansion. Most of the hydro facilities are small or medium in size and located on Peninsular Malaysia. However, Sarawak has the most hydroelectric potential of all the regions and envisions tapping into its hydroelectric reserves for new power plants and energy-intensive industry projects being developed in Sarawak as part of the government's Sarawak Corridor of Renewable Energy (Score) program. In 2012, hydroelectric capacity was about 35 percent of Sarawak's power capacity and is anticipated to expand to an 80-percent share by 2020 according to the government. Sarawak Hidro, a subsidiary of the Ministry of Finance, developed the massive 2,400-MW Bakun Hydroelectric plant in



Sarawak. The first 300-MW unit came online in mid-2011, and the other seven turbines were brought online a year later. The 944 MW Murum Dam is nearly complete and is expected to be online in 2014. The Sarawak government plans to construct another nine hydro dams with a total generation capacity of 4 GW by 2020. According to the Sarawak government, total potential hydroelectric capacity in the state is 20 GW.

Another key renewable fuel used to generate electricity is biomass. As part of its efforts to reduce carbon dioxide emissions by 40 percent by 2020 compared to its 2005 level and diversify its electricity fuel mix, Malaysia encourages investment in other types of renewable energy projects. The government's goal is that renewable sources, excluding large hydroelectric plants, will account for 5.5 percent of electricity capacity by 2015 compared to 1 percent in 2012. As part of this endeavor, Malaysia enacted feed-in tariffs for solar, biomass, biogas, and mini-hydro projects. Malaysia envisions capacity to grow from 219 MW in 2011 to 2,080 MW in 2020.

Malaysia has also discussed building two nuclear power facilities by 2021, although this project has encountered delays resulting from industry reluctance following Japan's Fukushima nuclear disaster in 2011.



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## Notes

- Data presented in the text are the most recent available as of September 3, 2013.
- Data are EIA estimates unless otherwise noted.

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